

PATENT COOPERATION TREATY

PCT/GB00/00

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE
in its capacity as elected Office

Date of mailing (day/month/year) 06 November 2000 (06.11.00)	Applicant's or agent's file reference JKM/BA/WS.11
International application No. PCT/GB00/00407	Priority date (day/month/year) 12 February 1999 (12.02.99)
International filing date (day/month/year) 09 February 2000 (09.02.00)	
Applicant KENINGTON, Peter	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
08 September 2000 (08.09.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35 Form PCT/IB/331 (July 1992)	Authorized officer Olivia TEFY Telephone No.: (41-22) 338.83.38
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GB0000407

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference JKh/BA/p100407	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/00407	International filing date (day/month/year) 09/02/2000	Priority date (day/month/year) 12/02/1999
International Patent Classification (IPC) or national classification and IPC H03F1/32		
Applicant WIRELESS SYSTEMS INTERNATIONAL LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 7 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☐ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 08/09/2000	Date of completion of this report 30.04.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Dietsche, S Telephone No. +49 89 2399 7465 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/00407

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-19 as published

Claims, No.:

8-24 as published

1-7,25-32 as received on 21/03/2001 with letter of 16/03/2001

Drawings, sheets:

1/17-17/17 as published

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/00407

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application.
- ☒ claims Nos. 1-32.

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 1-32 are so unclear that no meaningful opinion could be formed (*specify*):
see separate sheet
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☐ no international search report has been established for the said claims Nos. .

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

- ☐ the written form has not been furnished or does not comply with the standard.
- ☐ the computer readable form has not been furnished or does not comply with the standard.

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/00407

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

1. The following documents will be referred to in this international preliminary examination report:

D1 = US-A-5 155 448 (POWELL JACK) 13 October 1992 (1992-10-13)
D2 = EP-A-0 544 117 (NIPPON ELECTRIC CO) 2 June 1993 (1993-06-02)
D3 = US-A-5 770 971 (MCNICOL JOHN DUNCAN) 23 June 1998 (1998-06-23)
D4 = EP-A-0 054 811 (LICENTIA GMBH) 30 June 1982 (1982-06-30)

2. With reference to item III and item VIII, the examiner is at present not in the position to give a meaningful opinion with regard to novelty, inventive step and industrial applicability concerning the subject-matter of the whole set of claims 1-32 due to serious clarity objections under Art. 6 PCT.

- 2.1 The subject-matter of the independent apparatus claim 1 claiming "an amplification means and frequency conversion means" is basically defined by a "linearisation means ... to introduce a correction signal that is adapted to make the overall ... characteristic of the apparatus more linear by linearising both the amplification means and frequency conversion means". Thus, the subject-matter of the independent apparatus claim 1 is totally unclear, since it is basically defined by the result to be achieved, contrary to the requirements of Art. 6 PCT (cf. PCT-Gazette, Section IV, III-4.7).

Due to this substantial lack of clarity, the subject-matter of present claim 1 and the subject-matter of the claims 2-24 depending on claim 1 were no longer considered during the following examination.

- 2.2 For the same reasons as elaborated above with respect to claim 1 (point 2.1), the subject-matter of the corresponding independent method claim 25 is totally unclear, since it is basically defined by the result to be achieved, contrary to the requirements of Art. 6 PCT (cf. PCT-Gazette, Section IV, III-4.7).

Due to this substantial lack of clarity, the subject-matter of present claim 25 and the subject-matter of the claims 26-32 depending on claim 25 were no longer considered during the following examination.

3. With respect to item VII, the present application contains the following defects:

- 3.1 Contrary to the requirements of Rule 6.3 b) PCT, the independent claims 1 and 25 are not drafted in the two-part form, with those features being known from the closest prior art document being placed in the preamble of the claim, and new features being placed in the characterising portion of the claim.
- 3.2 Contrary to the requirements of Rule 6.2 b) PCT, the present set of claims does not contain reference signs to increase the intelligibility of the claims.

4. Insofar as the present application can be understood, and in view of the available prior art documents (e.g. D1-D4), the examiner is of the opinion that the subject-matter of the claims 1, 2, 11-26 and 30-32, even if suitably clarified (cf. point 2.1), would not comply with the requirements of Art. 33 (3) PCT, since none of these claims appears to involve an inventive step. In this context, it should be noted that amplifier arrangements comprising "linearisation means" are widely known in the art (e.g. from D1-D3). Since such linearised amplifiers are generally used as final stage of a transmission chain, generally comprising further devices like mixers and filters, the use of a known amplifier arrangement in conjunction with "frequency conversion means", as claimed in claims 1 and 25, respectively, is an obvious design possibility for a person skilled in the art and does, therefore, not involve an inventive step. Moreover, the subject-matter of the dependent claims 2, 11-24, 26 and 30-32 is either directly known from at least one of the above cited prior art documents D1-D4 or corresponds to an obvious generalisation, like the use of the "signal processing apparatus" in "a mobile handset or base station", as claimed in present claim 24.

The examiner is, however, of the opinion that the subject-matter of the remaining claims 3-10 and 27-29, if suitably clarified (cf. point 2.1), would meet the requirements of Art. 33 (2) (3) and (4) PCT. In this context, it is noted that the prior art documents D1-D3 disclose amplifiers with linearisation means wherein one or more pilot signals are applied to the input terminal of the overall amplifier arrangement, i.e. to the input terminal of the linearisation means which precedes the power amplifier, in order to balance the different signal paths of the amplifier arrangement. In contrast to this, claims 3 and 27 depending on claims 1 and 25,

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/00407

respectively, claim the introduction of a pilot signal **prior** to frequency conversion and amplification, in order to compensate also for distortions generated by the first stage (e.g. mixer) of the transmitter. Since this particular feature is neither known from, nor rendered obvious by any available prior art documents, the subject-matter of the claims 3-10 and 27-29, if suitably clarified, appears to meet the requirements of Art. 33 (2) (3) and (4) PCT.

20 REPLACED BY
ART 34 AMDT

Claims

1. Signal processing apparatus comprising signal amplification means and frequency conversion means which operate in succession on an input signal, characterised in that linearisation means is provided between the amplification means and the frequency conversion means to introduce a correction signal that is adapted to make the overall input and output characteristic of the apparatus more linear.
2. Signal processing apparatus according to claim 1, wherein a feedback signal derived from the output of the apparatus is used by the linearisation means to adapt the correction signal.
3. Signal processing apparatus according to claim 2, further comprising pilot signal generation means for introducing a pilot signal into the input signal prior to frequency conversion and amplification, wherein the feedback signal contains distortion components from the pilot signal produced by the frequency conversion means and/or the amplification means.
4. Signal processing apparatus according to claim 3, wherein the pilot signal is a CW carrier signal, a full carrier AM signal, a suppressed carrier AM signal, a single sideband signal, a quadrature amplitude modulated signal, a filtered quadrature phase shift keyed signal, a direct sequence spread spectrum signal, or a frequency hopped carrier signal modulated with any of the foregoing kinds of signal.
5. Signal processing apparatus according to claim 3, wherein the pilot signal is a two-tone, or multi-tone, pilot signal.
6. Signal processing apparatus according to any one of claims 3 to 5, wherein the pilot signal is removed from the output of the apparatus by a filter or by the introduction of a pilot cancellation signal.
7. Signal processing apparatus according to claim 6, wherein the pilot cancellation signal is adjusted using feedback derived from the output of the apparatus.

8. Signal processing apparatus according to claim 6 or 7, wherein the pilot cancellation signal comprises a frequency converted, phase shifted and amplitude adjusted version of the pilot signal.
9. Signal processing apparatus according to any one of claims 6 to 8 wherein a digital signal processor is used to control the pilot cancellation signal using feedback from the output of the signal processing apparatus.
10. Signal processing apparatus according to any one of claims 3 to 9, further comprising means for cancelling signals which are images of the pilot signal.
11. Signal processing apparatus according to any preceeding claim, wherein a digital signal processor is used to control the correction signal using feedback from the output of the signal processing apparatus.
12. Signal processing apparatus according to any preceding claim, wherein the linearisation means comprises distortion generating means for producing the correction signal from the output signal of whichever of the amplifying means or the frequency conversion means precedes it.
13. Signal processing apparatus according to claim 12, wherein the distortion generating means comprises non-linearity generating means.
14. Signal processing apparatus according to claim 13, wherein the non-linearity generating means uses anti-parallel diodes, a FET channel, dual gate GaAs FETs operating close to pinch-off, Schottky diodes, mixers or multipliers in the non-linearity generating process.
15. Signal processing apparatus according to claim 14, wherein the non-linearity generating means comprises means which generates the non-linearity by mixing its input signal with itself one or more times to produce the non-linearity.
16. Signal processing apparatus according to claim 15, wherein the mixing means generates a third order non-linearity by mixing the input to the non-linearity generator with itself and then with its input.

17. Signal processing apparatus according to claim 15 or 16, wherein components of the non-linearity are generated and controlled separately.
18. Signal processing apparatus according to claim 17, wherein in-phase and quadrature signals are produced from each separately generated non-linearity component and are controlled separately.
19. Signal processing apparatus according to any preceding claim, wherein the frequency conversion means comprises mixing means for mixing a mixing signal into a received signal destined to be frequency converted.
20. Signal processing apparatus according to any preceding claim, wherein the frequency conversion means is upconversion means for converting an intermediate frequency band signal into a radio frequency band signal.
21. Signal processing apparatus according to any one of claims 1 to 19, wherein the frequency conversion means is downconversion means for converting a radio frequency band signal into an intermediate frequency band signal.
22. Signal processing apparatus according to claim 20 or 21, wherein the frequency conversion means comprises in-phase and quadrature signal paths for handling in-phase and quadrature signals representing a signal at the intermediate frequency band, wherein there is a separate, independently controlled, linearisation means operating on each of these signal paths.
23. Signal processing apparatus according to any preceding claim comprising means for performing CDMA processing on the signals.
24. A mobile handset or a base station comprising receiving means or transmitting means, the receiving means or transmitting means comprising signal processing apparatus according to any one of the preceding claims.

25. A method of processing an input signal to produce an output signal, the method comprising the steps of signal amplification and frequency conversion, characterised by the step of introducing, between the steps of amplification and frequency conversion, a correction signal that is adapted to make the overall input and output characteristic of the signal processing method more linear.

26. A method according to claim 25, comprising the step of using a feedback signal derived from the output signal of the signal processing method to adapt the correction signal.

27. A method according to claim 26, further comprising the step of introducing a pilot signal into the input signal prior to frequency conversion and amplification, wherein the feedback signal contains distortion components from the pilot signal produced by the frequency conversion means and/or the amplification means.

28. A method according to claim 27, further comprising the step of removing the pilot signal from the output signal of the method by filtering or by introducing a pilot cancellation signal.

29. A method according to claim 28, comprising the step of adjusting the pilot cancellation signal using feedback derived from the output signal of the signal processing method.

30. A method according to any one of claims 25 to 29, wherein the correction signal is produced by a step of distorting the signal produced by whichever of the amplifying and frequency conversion steps precedes it.

31. A method according to claim 30, wherein the step of distortion generation comprises the step of generating and controlling non-linearity components independently.

32. A method according to any one of claims 25 to 31, further comprising the step of performing CDMA processing on the signals.

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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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2002

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17 August 2000 (17.08.2000)

PCT

(10) International Publication Number
WO 00/48309 A3

(51) International Patent Classification⁷: **H03F 1/32**

(21) International Application Number: **PCT/GB00/00407**

(22) International Filing Date: 9 February 2000 (09.02.2000)

(25) Filing Language: **English**

(26) Publication Language: **English**

(30) Priority Data:
9903179.1 12 February 1999 (12.02.1999) **GB**

(71) Applicant (for all designated States except US): **WIRELESS SYSTEMS INTERNATIONAL LIMITED**
[GB/GB]: Innovation House, Bristol Business Park, Coldharbour Lane, Bristol BS16 1EJ (GB).

(81) Designated States (national): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report

(72) Inventor; and

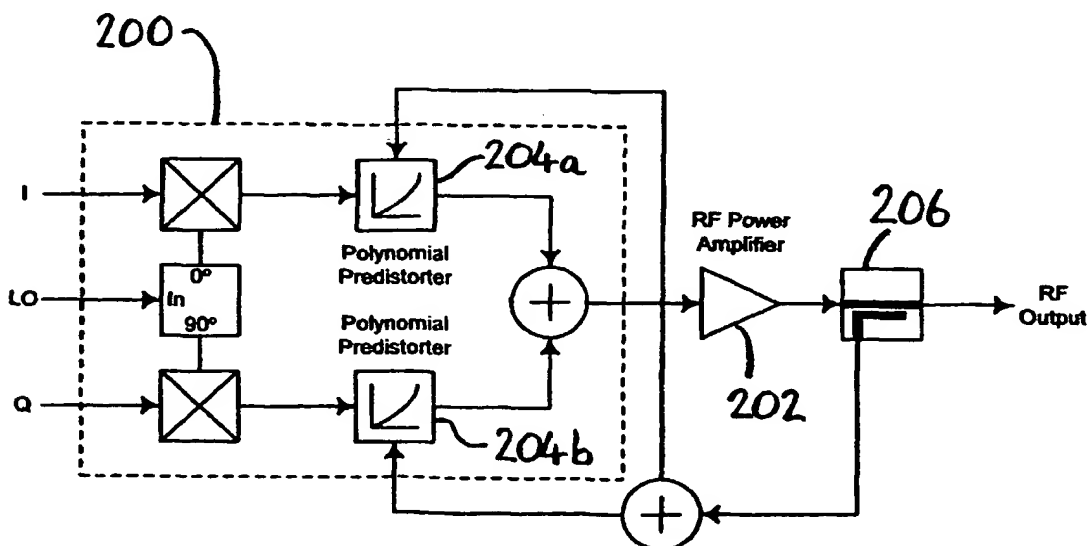
(75) Inventor/Applicant (for US only): **KENINGTON, Peter** [GB/GB]: Trap Farm, Devauden Green, Chepstow NP6 6PE (GB).

(88) Date of publication of the international search report:
31 January 2002

(74) Agents: **HOGG, Jeffery, Keith** et al.: Withers & Rogers, Goldings House, 2 Hays Lane, London SE1 2HW (GB).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **METHOD AND APPARATUS FOR DIGITALLY LINEARISING AN AMPLIFIER**



(57) Abstract: A non-linearity generator (104) operates on a signal between a frequency converter (100) and an amplifier (102) and acts as a postdistorter for the component it follows and as a predistorter for the component it precedes, thus linearising the overall input-output characteristic of the circuit. Cross modulation components distorting an injected pilot signal provide a feed back signal which is used to control the distortion applied by non-linearity generator. The non-linearity generator can be adapted to cope with widely spaced input tones. The circuit may form part of a transmitter or a receiver.



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INTERNATIONAL SEARCH REPORT

International Application No.
PCT/GB 00/00407

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H03F1/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H03F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 155 448 A (POWELL JACK) 13 October 1992 (1992-10-13)	1-7, 10, 12, 19, 20, 23-30, 32
A	the whole document	8, 9
X	EP 0 544 117 A (NIPPON ELECTRIC CO) 2 June 1993 (1993-06-02)	1-3, 5, 10-13, 19, 20, 23-27, 30-32
	the whole document	
X	US 5 770 971 A (MCNICOL JOHN DUNCAN) 23 June 1998 (1998-06-23)	1-4
	the whole document	

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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

11 May 2000

Date of mailing of the international search report

28. 08. 2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

SEGAERT, P

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/GB 00/00407

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 054 811 A (LICENTIA GMBH) 30 June 1982 (1982-06-30) the whole document -----	1,2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 00/00407

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-13, 19-20, 23, 24-32

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

1. Claims: 1-13,19-20,23,24-32

A signal processing apparatus comprising signal amplification means, frequency conversion means, and linearisation means characterised by comprising pilot signal generation means.

2. Claims: 14-18

A signal processing apparatus comprising signal amplification means, frequency conversion means, and linearisation means whereby the linearisation means is of a particular kind

3. Claim : 21

A signal processing apparatus comprising signal amplification means, frequency conversion means, and linearisation means whereby the frequency conversion means is a downconversion means.

4. Claim : 22

A signal processing apparatus comprising signal amplification means, frequency conversion means, and linearisation means whereby the frequency conversion means comprises in-phase and quadrature signal paths.

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference JKM/BA/WS. 11	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/ 00407	International filing date (day/month/year) 09/02/2000	(Earliest) Priority Date (day/month/year) 12/02/1999
Applicant WIRELESS SYSTEMS INTERNATIONAL LIMITED et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☒ Unity of invention is lacking (see Box II).

4. With regard to the title,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

METHOD AND APPARATUS FOR DIGITALLY LINEARISING AN AMPLIFIER

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

2

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 00/00407

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-13, 19-20, 23, 24-32

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

1. Claims: 1-13,19-20,23,24-32

A signal processing apparatus comprising signal amplification means, frequency conversion means, and linearisation means characterised by comprising pilot signal generation means.

2. Claims: 14-18

A signal processing apparatus comprising signal amplification means, frequency conversion means, and linearisation means whereby the linearisation means is of a particular kind

3. Claim : 21

A signal processing apparatus comprising signal amplification means, frequency conversion means, and linearisation means whereby the frequency conversion means is a downconversion means.

4. Claim : 22

A signal processing apparatus comprising signal amplification means, frequency conversion means, and linearisation means whereby the frequency conversion means comprises in-phase and quadrature signal paths.

INTERNATIONAL SEARCH REPORT

International Application No

P GB 00/00407

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H03F1/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H03F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 155 448 A (POWELL JACK) 13 October 1992 (1992-10-13)	1-7, 10, 12, 19, 20, 23-30, 32
A	the whole document ---	8, 9
X	EP 0 544 117 A (NIPPON ELECTRIC CO) 2 June 1993 (1993-06-02)	1-3, 5, 10-13, 19, 20, 23-27, 30-32
	the whole document ---	
X	US 5 770 971 A (MCNICOL JOHN DUNCAN) 23 June 1998 (1998-06-23)	1-4
	the whole document ---	
	--- -/-	

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

11 May 2000

Date of mailing of the international search report

2⁰ 08. 2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

SEGAERT, P

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 00/00407

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/00407

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